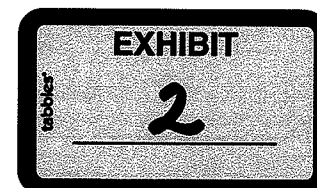


DEPARTMENT OF HOMELAND SECURITY

Office of Inspector General

INTERIM REPORT

Hurricane Katrina: A Review of Wind Versus Flood Issues



OIG-07-62

July 2007

Office of Inspector General

U.S. Department of Homeland Security
Washington, DC 20528



**Homeland
Security**

JUL 26 2007

Preface

The Department of Homeland Security (DHS) Office of Inspector General (OIG) was established by the Homeland Security Act of 2002 (*Public Law 107-296*) by amendment to the Inspector General Act of 1978. This is one of a series of audits, inspections, and special reports prepared as part of our oversight responsibilities to promote economy, effectiveness, and efficiency within the department.

This report assesses the Federal Emergency Management Agency's (FEMA) oversight of the Write-Your-Own companies performance in adjusting National Flood Insurance Program flood claims in the wake of Hurricane Katrina. We were directed in the Department of Homeland Security Appropriations Act, 2007 to determine whether damages from wind were improperly attributed to flooding. We examined relevant documentation and interviewed FEMA and insurance officials to assess the flood insurance adjustment process. This is an interim report to provide Congress and FEMA with our findings and conclusions to date. We are continuing our review with a focus on insurers' adjustments of claims for wind damage under homeowners' coverage.

The recommendations herein were developed to the best knowledge available to our office and were discussed in draft with those responsible for implementation. It is our hope that this report will result in improvements to the National Flood Insurance Program. We express our appreciation to all who contributed to the preparation of this report.

A handwritten signature in cursive script, reading "Richard L. Skinner".

Richard L. Skinner
Inspector General

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Abbreviations

FEMA	Federal Emergency Management Agency
DHS	Department of Homeland Security
NFIP	National Flood Insurance Program
WYO	Write Your Own Companies
FIRM	Flood Insurance Rate Map
CAT	Catastrophe Adjusting Firms
OIG	Office of Inspector General

Interim Report

Hurricane Katrina: A Review of Wind Versus Flood Issues

Executive Summary

The Department of Homeland Security Appropriations Act, 2007 (Public Law 109-295), directed the Department of Homeland Security, Office of Inspector General, to investigate whether, and to what extent, insurance companies participating in the National Flood Insurance Program (NFIP) – referred to as Write-Your-Own Companies (WYOs) improperly attributed damages from Hurricane Katrina to flooding rather than to windstorms covered under homeowner policies or wind insurance pools.

Our objective for this interim report was to determine whether NFIP claim records included indications that participating insurance companies attributed wind damage to flooding. We reviewed a sample of flood claim files in Mississippi, analyzed legal opinions, and quality control reports prepared by the Federal Emergency Management Agency (FEMA) on selected claims. In addition, we interviewed officials from FEMA, the Mississippi Coast Coliseum and Convention Center in Biloxi, Mississippi, insurance association representatives, insurance adjusters, WYO officials, and other experts in the field. Our sample revealed no evidence that wind damages were improperly attributed to flooding. Our conclusion is based on:

- Review of 98 flood claim files and analysis of evidence in those files;
- Interviews with 20 flood adjusters, representatives of insurance associations, and WYOs;
- Discussions with FEMA quality control adjusters and review of the quality control reports;
- Interviews with homeowners included in our sample; and
- Review of appeals and complaint records.

Although nothing came to our attention during our limited review to indicate that WYOs attributed wind damage to flooding, we cannot rule out the possibility that it occurred because of complicating factors such as:

- Difficulty in distinguishing between wind and flood damage, especially when there is nothing left of the property except a foundation (slab);
- Language in homeowners' insurance policies that can exclude coverage if flooding occurs concurrent with wind or other causes of damage;
- Adjusters either working for the WYOs or for the companies hired by WYOs, which creates the perception of a conflict of interest;
- FEMA oversight of WYOs is limited.

We plan to issue a final report that will include an analysis of wind claim files and other evidence.

FEMA officials have generally agreed with our findings and recommendations included in this interim report.

Background

Hurricane Katrina made landfall on the Mississippi coast at 10:00 a.m. on August 29, 2005. For the coastal areas in Mississippi, estimates for wind gusts ranged from 70 to 121 miles per hour, and storm surge reached a maximum height of 28 feet. Property damage was caused both by the hurricane force winds and the storm surge flooding. The Department of Homeland Security Appropriations Act, 2007 (Public Law 109-295), directed the Department of Homeland Security, Office of Inspector General, to investigate whether, and to what extent, insurance companies under the WYO program improperly attributed damages from Hurricane Katrina to flooding covered under the NFIP rather than to windstorms covered under homeowner policies or wind insurance pools.

Homeowner insurance policies typically cover wind but not flood damage. WYOs are private sector insurance companies authorized by NFIP to sell flood insurance. WYOs have no financial exposure when damage is caused by flood because the federal government, through the NFIP, reimburses WYOs for claims they pay. Although the NFIP does not have direct control over the WYOs, the WYOs agree each year to terms and conditions with FEMA on various compliance and business issues. This agreement provides, among other things, that WYOs will comply with written standards, procedures, and guidance issued by FEMA. For additional background on the NFIP, see Appendix A.

Our review objective was to determine whether NFIP claim records included indications that participating insurance companies attributed wind damage to flooding. We reviewed a sample of flood claim files in three Mississippi counties. We examined adjusters' comments and calculations relating to damage caused by flood as well as other evidence in the claim files such as photographs and correspondence between the insured and WYO. We also analyzed legal opinions, reinspection reports and NFIP complaint files. We interviewed officials from FEMA and the Mississippi Coast Coliseum and Convention Center, insurance association representatives, insurance adjusters, WYO officials, and other experts. It is important to note that we did not have the same access to the WYOs' records of wind claims as we did to the flood claims that are funded by the government. The wind claim files are a likely place to find indications that WYOs may have attributed wind damage to flooding. We have, however, issued administrative subpoenas for those records. We are issuing this interim report to inform Congress and FEMA of our findings to date. We will issue a final report after we have received and

reviewed the WYOs' records of wind claims. Further details on the scope of our review are included as Appendix B.

Results of Review

Our review of sample flood claims did not reveal evidence that the NFIP was used to subsidize wind damage. However, there is little evidence in flood claim files to determine whether payouts from the NFIP were fair and equitable for damages caused by both wind and water affecting the same structure. We continue to have questions with respect to wind damage settlements and have issued administrative subpoenas to the WYOs in our sample for claim files. In addition, we are analyzing whether WYOs were consistent in pricing selected categories of damages.

Was Wind Damage Attributed to Flooding?

Storm surge (flooding) was the primary cause of damages sustained along the Mississippi coast, but high wind velocity before the surges in water also caused damage. The central question is whether WYO companies, in settling claims, may have improperly attributed damage caused by wind to flooding in order to avoid liability under the standard homeowner's policy. This question is especially relevant in situations where the same WYOs held both homeowner and flood policies for the same insured property. Following is a summary of our review of the flood claims:

- We reviewed 98 flood claim files to determine whether they contained any indication that wind damage might have been attributed to flooding. The NFIP provided us the flood files, but did not provide wind claim files, which are maintained separately by the WYOs. Several of the flood claim files contained references to, and photographic evidence of, wind damage; however, with the exception of two files, there was no information on how much wind damage occurred, the cost of the damage, or whether wind claims were filed. There was no indication that wind damage was attributed to flooding or that flood insurance paid for wind damage. Information on select attributes of the files reviewed is shown in Appendix C.
- We interviewed 20 flood adjusters who did some of the damage investigations for the properties in the files we reviewed to determine how they conducted their inspections. Most adjusters were not involved in any wind damage assessments and felt they were not under pressure from WYOs to attribute wind damage to flooding. The process used by NFIP adjusters is described in Appendix D. They based their damage determinations on the physical evidence at the scene. Representatives from two associations representing the insurance industry were not aware of any instances of wind damage being attributed to flooding. Eleven representatives of the WYOs in our sample explained that they have plans to address catastrophic events such as

Hurricane Katrina and that they base adjustments on physical evidence at the damaged property. In total loss cases where only a foundation (slab) remained, it was often difficult to determine whether wind or flood was the cause of damage. Several WYO representatives allocated a portion of the loss to wind by using an evaluation of damage to the neighborhood, engineering support, analysis of wind data, aerial photographs, interviews, analysis of debris, and extent of the damage to trees.

- We also met with General Adjusters contracted by FEMA and reviewed reinspection reports to determine whether they had identified indications that wind damage was attributed to flooding. Reinspections are conducted by a team of General Adjusters as a quality control step in the flood adjustment process. Adjusters reviewed a sample of flood claim files to determine whether the adjustments conform to NFIP standards. There were 599 reinspections performed on Hurricane Katrina flood claims in Mississippi, and we reviewed 135 of the reports. None of the reports contained evidence that wind damage had been attributed to flooding. See Appendix E for more information on the reinspection process.
- We interviewed 36 homeowners included in our sample of flood claims to determine whether they believed their insurance companies improperly attributed wind damage to flooding. Payments for wind damage were received by 32 of these homeowners. Four of the 36 did not have insurance that covered wind damage. The amounts received ranged from \$630 to \$500,000. In 29 cases, those receiving wind settlements told us they were satisfied with the amounts paid under their homeowner's policy. There were 7 homeowners who were not satisfied with the amount of settlement for wind. Some of the reasons for their lack of satisfaction include: (1) they did not feel they received payment for damages caused by rain leaking through damaged roofs, (2) payments did not reflect increased costs of labor and materials after the storm, and (3) detached buildings were not covered.
- We reviewed NFIP appeals and complaints for assurance that there was no evidence indicating that WYOs attributed wind damage to flooding. Although one would not expect to find such complaints in flood claim files, we wanted to include all sources of information to which we had access. When policyholders had complaints about wind damage being attributed to flooding, they would most likely be documented in the WYOs' records of wind damage. There was only one appeal related to Hurricane Katrina. An appeal is a formal NFIP process where policyholders can seek a second review of their flood claim. There were 18 complaint letters filed with the NFIP. One included a complaint that the insurance company paid a flood claim, but denied a wind claim. NFIP responded that the flood claim was paid at policy limits and that the homeowner's frustration over the WYO's denial of wind coverage was not within the scope of the NFIP complaint handling process.

Our review of complaints revealed that none had a relationship to the issue of whether the NFIP paid for damages caused by wind.

Complicating Factors When Wind and Flood Occur Together

Although nothing came to our attention during our limited review to indicate that WYOs attributed wind damage to flooding, we cannot rule out the possibility that it occurred. Flood adjusters were professional and based their determinations on the physical evidence they observed. However, there are several complicating factors that contribute to the perception that WYOs might have attributed wind damage to flooding.

- First, it may be difficult to distinguish between wind and flood damage when the two perils occur concurrently, and especially when there is nothing left of the property except a foundation (slab). WYO flood adjusters do not generally identify or quantify damages that may have been caused by wind. The NFIP Claims Adjusters Manual does not direct adjusters to document whether wind was also involved in damages to a structure. According to data available, winds played a role in damages to the Mississippi coast. For example, hurricane force winds were present up to 4 hours prior to the storm surge. Experts told us that such a differential could contribute toward significant damage caused by wind. Appendix F graphically shows the time difference and impact of winds and surge.
- Second, insurance policies are difficult to understand and often misunderstood. Most insurance contracts are drafted to exclude flood damage. A typical homeowner's insurance policy is a contract with no negotiation and few people read or understand its contents. The insurance industry is primarily regulated at the state level. Policy forms are reviewed and approved by state agencies. Homeowners' policies historically have excluded flood damage. As many in the Gulf Coast have learned, most homeowners' policies have standard flood exclusions effectively denying coverage no matter what caused the flood.

Homeowners' policies normally contain language, which explicitly excludes flood damage, regardless of how the damage was caused. This provision is referred to as an "anti-concurrent causation" clause and these clauses have been standard in homeowner policies for decades. As with any catastrophic event, Hurricane Katrina has produced numerous lawsuits. One of the key issues raised in this private litigation between insurers and policyholders is the flood versus wind dispute – whether the standard homeowner's policy with an anti-concurrent causation clause will cover damage that resulted from Hurricane Katrina. Resolution of these cases will depend on extensive evidence of causation and interpretations of policy language. The following is a typical anti-concurrent causation clause for water damage:

We do not insure for loss caused directly or indirectly by any of the following excluded events. Such loss is excluded regardless of any other cause or event contributing concurrently or in any sequence to the loss. These exclusions apply whether or not the loss event results in widespread damage or affects a substantial area.

Water damage, meaning:

Flood, surface water, waves, tidal water, tsunami, overflow of a body of water, or spray from any of these, all whether driven by wind or not.

This language preempts coverage when, for example, an otherwise covered peril, such as hurricane force winds, causes flooding, an excluded peril.

The Mississippi Attorney General filed suit on behalf of the state against several major insurers seeking a ruling that the insurers must pay flood damages because hurricane winds caused the flooding. The suit alleged that the policy exclusions are ambiguous and should therefore not be enforced. The suit also alleged unfair trade practices on the part of the insurers representing that policies provided comprehensive hurricane coverage.

- A third factor adding to a perception that wind damage was improperly attributed to flood is that adjusters are either working for WYOs or for companies hired by WYOs, and many people believe this creates a conflict of interest. The WYO has no financial exposure for flood damage, so some adjusters might favor finding flood damages rather than wind damage to reduce the WYO's financial exposure. Although nothing came to our attention to indicate that adjusters attributed wind damage to flooding, the appearance of a conflict persists.
- Finally, FEMA's oversight of the WYOs is limited. Under FEMA regulations, the entire responsibility for providing a proper adjustment for both combined wind and water claims and flood-alone claims is the responsibility of the WYO company. FEMA's agreement with the WYOs provides that claim adjustments shall be binding upon FEMA. FEMA needs to increase its oversight role of the WYOs and that increased oversight can be accomplished by amending its agreement with the WYOs to make better use of its two quality control functions. Reinspections permit FEMA to take another look at the adjusters' work; however, they focus exclusively on adjustment of the flood claim. They could be expanded to include wind damage information. FEMA also performs operational reviews of WYOs. These operational reviews focus on flood insurance claims, underwriting, customer service, marketing, and litigation activities. These reviews also could be broadened to include wind damage information. In addition, the NFIP Claims Adjusters Manual provides no guidance on ensuring that wind damage is not attributed to flooding. Expanding the scope of these quality

control measures could help FEMA to ensure that the WYOs are not improperly attributing wind damage to flooding.

Conclusion and Recommendations

FEMA needs to increase oversight over damage claims that involve both wind and water on the same structure. Our limited review of the flood claims indicated that payouts on flood claims were timely and complied to NFIP terms. However, there is little evidence in flood claim files to determine whether payouts were fair and equitable for damages caused by both wind and water affecting the same structure. In addition, FEMA did not maintain documentation indicating the total damage to a structure and how much was attributable to flood and wind, nor is it required by the NFIP. As a result, NFIP oversight focused primarily on whether the flood claim was correctly adjudicated with little or no consideration for wind damage as a contributing factor. Under the current process, it is difficult to determine whether the NFIP paid a higher percentage or the entire damage claim involving both perils.

We recommend that the Administrator, Federal Emergency Management Agency:

1. Require Write Your Own Insurance Companies to document and make available to the NFIP the rationale and methodology for calculating flood and wind damage when there is evidence that both perils contributed to the damage, and revise the NFIP Claims Adjuster Manual to reflect these new requirements;
2. Expand the reinspection process to include a review of and determination that flood and wind damage on the same structure was settled in a fair and equitable manner to ensure that wind damage was not paid under the flood policy; and
3. Provide clear and concise guidance for adjusting total loss claims after catastrophic events when structures are completely destroyed by wind and water.

As discussed above, we have issued administrative subpoenas for WYO insurance companies records providing both wind and flood coverage. We plan to corroborate the documentation and assertions made in our review to determine whether and to what extent damages were improperly attributed to flooding rather than wind. We also plan to determine whether unit pricing for like materials paid under flood and wind claims were consistent and reasonable. We will issue our final report upon our completion of our wind claim analysis.

Discussion with Management

FEMA officials are in general agreement with our findings and recommendations with respect to this interim report. They did comment that recommendation #2 would require FEMA to review wind file data in conjunction with the flood claim file and that they currently have no authority to collect and analyze the related wind damage claims data on

the property receiving a flood claim payment to validate its accuracy. They have stated that options for corrective actions will be examined. We will furnish the officials the results of our additional review effort on wind claims and consistency of pricing of damages prior to our final report.

Appendix A

Overview of NFIP

The National Insurance Act of 1968 mandated the creation of a National Flood Insurance Program. There had been attempts at passing similar legislation since the 1950s; however, the destruction brought about by Hurricane Betsy in 1965 provided the momentum for Congress to make it a reality. Prior to 1968, relief for people affected by flood was limited to disaster assistance.

NFIP enables property owners in participating communities to purchase flood insurance in exchange for state and local floodplain management to reduce future flood damages.

The National Insurance Act of 1968 prescribes three main objectives to be accomplished by the NFIP:

- Provide affordable flood insurance to qualified homeowners,
- Reduce flood damages through floodplain management regulations, and
- Identify and map the Nation's floodplains.

The Act also establishes two categories of properties:

- Pre-FIRM (Flood Insurance Rate Map): Buildings constructed prior to the initial flood map for the community. These buildings are entitled to subsidized flood insurance rates, as long as the communities where they are located comply with floodplain management regulations.
- Post-FIRM: Buildings constructed (or substantially improved) after the initial flood map for the community, or after December 31, 1974, whichever is later. The Act mandates that full actuarial rates, reflecting the true flood risk, be charged on these structures.

In creating the NFIP, Congress found that a large flood insurance program with "*large scale participation of the Federal Government, and carried out to the maximum extent practicable by the private insurance industry, is feasible and can be initiated.*" In keeping with this purpose, FEMA has contractual arrangements with 95 private insurance companies to sell policies and adjust and process claims, in what is called the "Write-Your-Own" (WYO) program, to differentiate it from the "NFIP Direct" program, or policies written directly by the NFIP. Approximately 97 percent of flood policies are written by WYOs.

In view of limited participation in the program, in 1973 Congress passed the Flood Disaster Protection Act, which strengthened NFIP's outreach efforts by:

- Restricting federal aid in non-participating flood prone communities.

Appendix A

- **Introducing the Mandatory Flood Insurance Purchase Requirement, that mandated lenders require evidence of flood insurance in areas deemed to be flood hazard areas.**

In 1994, Congress amended the 1968 and the 1973 Acts via the National Flood Insurance Reform Act, requiring, among other things:

- **Increased compliance by mortgage lenders with the mandatory purchase requirement,**
- **Increased flood coverage amounts, and**
- **Updates to flood maps every 5 years.**

In 2004, Congress enacted the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, which required, among other things:

- **A 5-year pilot program to deal with repetitive loss properties, including federal funding for the purchase of "severe repetitive loss properties."**
- **Establishment of regulatory appeals process for claimants.**

Appendix B

Purpose, Scope, and Methodology

The Department of Homeland Security Appropriations Act, 2007 (Public Law 109-295), directed the Department of Homeland Security, Office of Inspector General, to investigate whether, and to what extent, insurance companies under the WYO program pursuant to section 1345 of the National Flood Insurance Act of 1968 (42 U.S.C. 4081) and subpart C of part 62 of title 44, Code of Federal Regulations, improperly attributed damages from Hurricane Katrina to flooding covered under the National Flood Insurance Program (NFIP) rather than to windstorms covered under homeowner policies or wind insurance pools.

Specifically, our review objective was to determine whether NFIP records contained evidence of WYO companies attributing wind damage to flooding.

We interviewed FEMA and NFIP Bureau and Statistical Agent personnel, as well as experts in the field of wind and flood damage assessment. In addition, we interviewed 20 adjusters and 11 officials from the 12 WYOs in our sample of claims, and representatives from two insurance associations. We interviewed 36 homeowners to determine whether they received wind settlements and their satisfaction with the amount received. We limited our review to flood insurance claims paid through NFIP, since we do not have the same access to wind claims under homeowner policies written by private insurers as we do to NFIP flood claim files. However, we have issued administrative subpoenas to the insurance companies in our sample to receive wind claim files. We selected a judgmental sample of 100 flood insurance claim files from the 3 coastal counties in Mississippi – Hancock, Harrison, and Jackson – because the wind versus flood issue was most prevalent in that area. The sample consisted of flood claims in areas of high surges and low surges, with some settlements paid at the policy limits and some other settlements paid at less than the policy limits. We also reviewed a sample of reinspections performed on Hurricane Katrina-related flood claims in the state of Mississippi. The primary purpose of this review was to determine if any of the reinspections identified situations where wind damages were attributed to flooding.

We conducted fieldwork in Washington, DC; at the NFIP Bureau and Statistical Agent facilities in Lanham, Maryland; in Mississippi; and at Clemson University in South Carolina. We conducted our audit from December 2006 to May 2007 under the authority of the Inspector General Act of 1978, as amended, and according to generally accepted government auditing standards.

Appendix C

<i>Attributes of Claim Files Reviewed</i>		
	Number of Sample	Percentage of Sample*
Wind Damage Paid by NFIP	0	0%
Primary Residence	77	78.6%
Paid at Policy Limit	69	70.4%
Foundation (slab) Only	33	33.7%
Reinspected by NFIP	4	4.1%

*Based on reviewing 98/100 claims. Two files were not provided due to pending litigation.

<i>Building Attributes</i>		
	Number of Sample	Percent of Sample
Pre-FIRM*	75	76.5%
Post-FIRM*	23	23.5%
Total	98	100.0%
Number of Stories*		
1	68	69.4%
1.5	3	3.1%
2	27	27.5%
Total	98	100%
Age of Property*		
0 - 10 years	21	21.4%
11 - 20 years	12	12.2%
21 - 30 years	9	9.2%
31 - 40 years	28	28.6%
41 - 50 years	12	12.3%
Over 50 years	16	16.3%
Total	98	100%

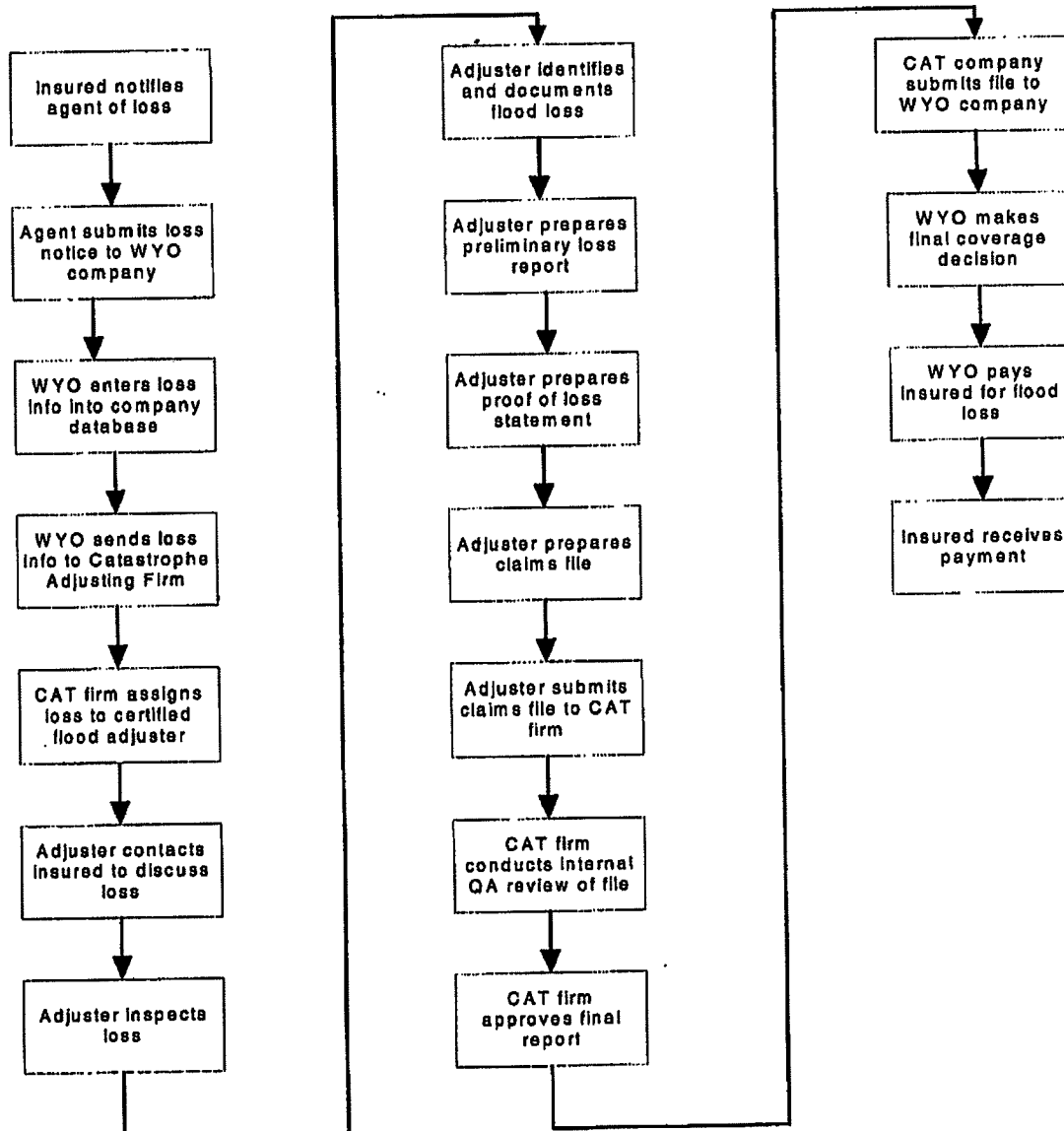
*Based on reviewing 98/100 claims. Two files were not provided due to pending litigation.

Appendix D

NFIP Claims Adjustment Process

NFIP uses federal employees, contractors, and private sector organizations to process flood claims. Contractors and private sector organizations consist of insurance carriers, flood claims processing companies, catastrophe adjusting firms (CAT), and information technology management companies that support core NFIP databases and systems.

The following flowchart highlights the key activities involved in a standard NFIP flood claim adjustment process.



Appendix D

A reason for using a standard process is to ensure that similar loss scenarios are assessed and adjusted similarly by different adjusters, regardless of experience, capabilities, or company affiliation. Flood adjusters are required to be certified by the NFIP, but this requirement is waived in the case of adjusters employed directly by one of the flood insurance carriers. FEMA requires that uncertified adjusters receive appropriate supervision and direction from certified or more experienced adjusters.

Appendix E

NFIP Reinspection Process

NFIP uses a claims adjustment reinspection process ("reinspection") to review a judgmentally selected sample of claims adjustments after each flood event. The purpose of this reinspection is to determine whether the adjustment process conformed to NFIP standards and guidelines. It is also used to identify cases of over- or underpayments of damage settlements or fees. The review is conducted by experienced claims adjusters (General Adjusters) employed by NFIP's Bureau and Statistical Agent.

Reinspections are selected in two ways. First, NFIP conducts routine reinspections of a judgmentally selected sample of claims adjustments on an ongoing basis. Special request reinspections are also conducted in the event of an appeal or formal complaint of an adjustment, or in any case when more information is needed regarding a specific adjustment.

According to the reinspection database maintained by the NFIP's Bureau and Statistical Agent, 599 reinspections were performed on Hurricane Katrina-related flood claim adjustments in Mississippi. Reinspection documentation includes a reinspection report, a detailed itemization of the results of the reinspection against a standard NFIP reinspection checklist, and comments from the General Adjuster who performed the reinspection.

Appendix F

Overview of Meteorological Data

The graphs shown on the following pages are the product of a computer simulation by WorldWinds, Inc., using data gathered from FEMA, National Oceanic and Atmospheric Administration's National Weather Service, U.S. Geological Service, National Aeronautics and Space Administration, U.S. Army Corps of Engineers, as well as other sources.

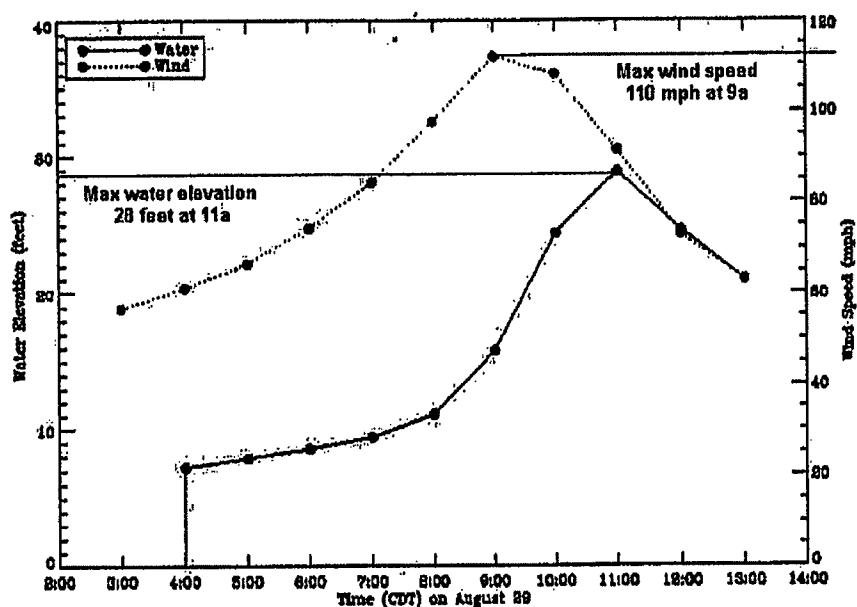
These graphs demonstrate, for specific coordinates, that winds reached speeds between 90 and 110 mph prior to maximum water surge in Hancock, Harrison, and Jackson Counties. The high winds preceding the flooding indicate that there was damage to structures from both wind and flooding. The Saffir-Simpson Hurricane Scale estimates potential property damage and flooding expected along the coast from hurricane landfall. Wind speed is the determining factor in the scale. Below are summaries of the estimated damages to property based on the following hurricane categories:

- **Category One Hurricane:** Winds of 74-95 mph. Storm surge is generally 4-5 feet above normal. No damage to building structures. Damage primarily to shrubbery, trees, and unanchored mobile homes.
- **Category Two Hurricane:** Winds 96-110 mph. Storm surge is generally 6-8 feet above normal. There is some roofing material, door, and window damage to buildings. Considerable damage to shrubbery and trees with some trees blown down. Considerable damage to mobile homes, poorly constructed signs, and piers.
- **Category Three Hurricane:** Winds of 111-130 mph. Storm surge is generally 9-12 feet above normal. Some structural damage to small residences and utility buildings. Damage to shrubbery and trees with foliage blown off and large trees blown down. Mobile homes and poorly constructed signs are destroyed.
- **Category Four Hurricane:** Winds of 131-155 mph. Storm surge is generally 13-18 feet above normal. Some complete roof structure failures on small residences. Shrubs, trees, and all signs are blown down. Complete destruction of mobile homes. Extensive damage to doors and windows.
- **Category Five Hurricane:** Winds greater than 155 mph. Storm surge is generally greater than 18 feet above normal. Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. All shrubs, trees, and signs blown down. Complete destruction of mobile homes. Severe and extensive window and door damage.

Appendix F

Hancock County

Bay Saint Louis, MS
Coordinates: 30.32, 89.27

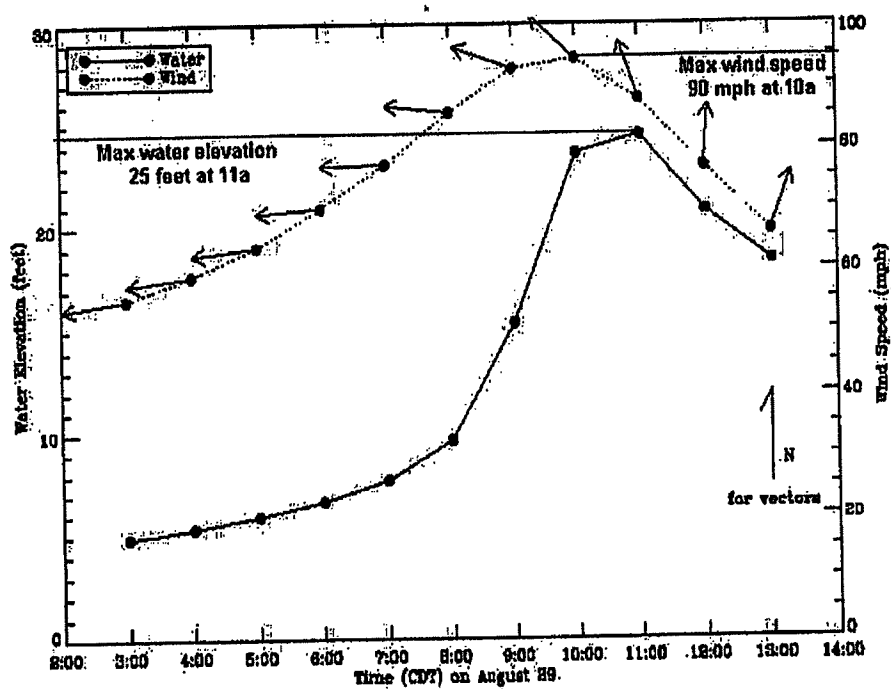


Note: Wind over 100mph before water reaches 10 ft.
Wind speeds remain above hurricane force for 4 hours before water peaks.

Appendix F

Harrison County

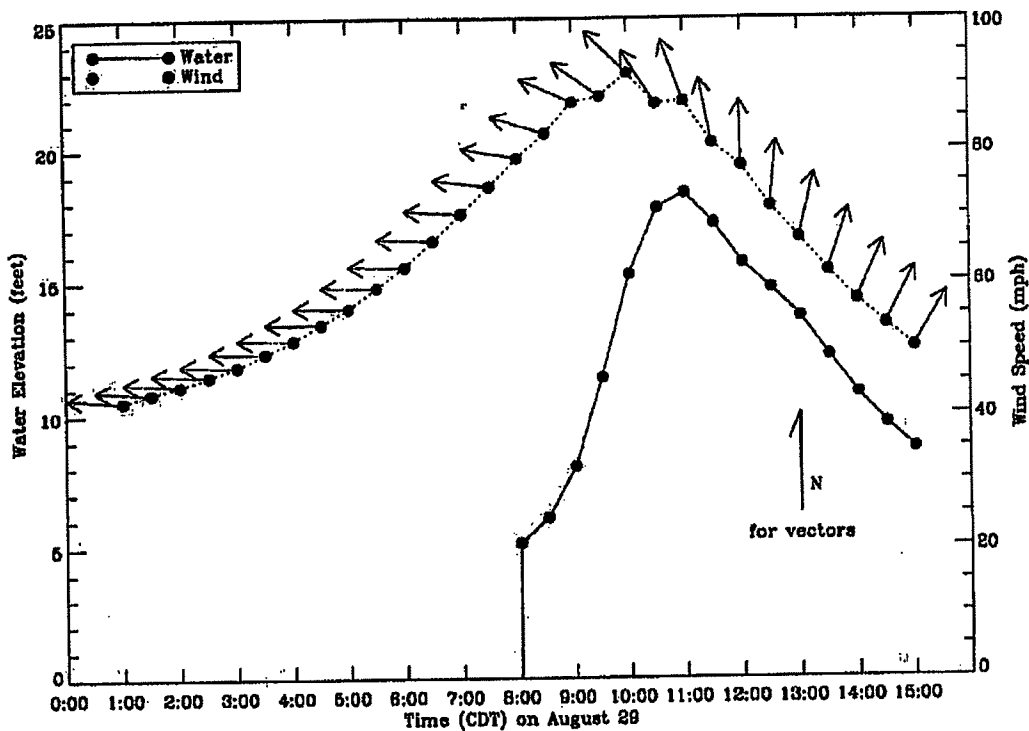
Biloxi, MS
Coordinates 30.41, 88.9



Note: Wind speeds sustained above hurricane force for 4 hours before water peaks.

Appendix F

Jackson County
Ocean Springs, MS
Coordinates: 30.43, 88.84



Note: Wind speeds sustained above hurricane force for 4 hours before water peaks

Appendix G

Major Contributors to This Report

Dennis White, Assistant Deputy Inspector General for Disaster Assistance Oversight
Gina Smith, Director, HQ Disaster Mitigation, Response & Recovery
Cliff Melby, Senior Program Analyst
Raul Adrian, Senior Auditor
Craig Anderson, Program Analyst
Patti Smith, Auditor

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